Part

E

# Methods and Assumptions regarding PALCO's Vegetation Inventory

# PROCEDURES AND ASSUMPTIONS

This section summarizes the procedures and assumptions relied upon to produce the timber volume estimates and the maps. Part 1 describes the classification of Pacific Lumber's timberlands. Part 2 discusses the methods used to produce the maps. Part 3 details the methods used to produce the timber volume estimates.

## TIMBER CLASSIFICATION

Both the maps and the inventory are baaed on the classification of Pacific Lumber's forest lands into homogeneous timber stand types. The timber stand classification system was designed specifically for the Pacific Lumber Company. Three stand conditions uncut old growth, residual (cutover), and young growth, and four density classes are recognized. The young growth understory was identified where it was visible on the aerial photography. Timber types were purposely kept broad to avoid an unnecessary proliferation of classes. A 20-acre minimum size was used for non-contrasting timber stand types, and a 10-acre minimum size for contrasting timber stand types. Contrasting types include those areas that change in stand condition, such as non-timber sites in timbered areas, areas where the species composition is different from that of the general surrounding or adjacent areas, and areas where the density changes by more than one density class.

Hammon, Jensen, Wallen & Associates (HJW) stereoscopically delineated and classified timber stands and other vegetation types on 1984 aerial photography supplied by the Pacific Lumber Company. Photographs are black and white, 1:12000 scale contact

prints flown during August and September of 1984 by the Richard B. Davis Company, Inc. of Crescent City, California. The Pacific Lumber Company forestry staff indicated on these photos the areas where harvesting had occurred between the date of the photography and the date of the inventory. To update these areas to the date of the inventory (January 1, 1986), supplemental aerial photography, at a scale of 1:30000, was flown on August 3, 1986, by Pacific Aerial Surveys, a division of Hammon, Jensen, Wallen & Associates. Sufficient field inspection was then conducted to insure the accuracy of the photo interpretation and to identify elements (such as species composition or understory size) which may not have been adequately discernable on the photographs alone.

# The Pacific Lumber Company

## Timber Classes

### Stand Structure

| | |
|---|---|
| 00 | Uncut old growth, large size |
| 0 | Uncut old growth, average size |
| OY | Uncut old growth, small size |
| OYY | Uncut old growth with large size young growth |
| R | Residual (cutover) |
| s | Residual, small size (cutover) |
| YY | Young growth, large size - diameters to 40" + |
| W C | Young growth, large size with large size poles |
| Y | Young growth, medium size - diameters to 28" |
| YC | Young growth, medium size with large size poles |
| YYR | Young growth, large size - thinned stands |
| YR | Young growth, medium size - thinned stand6 |
| C | Poles, large size - 30-60 feet |
| B | Poles, small size - 10-30 feet |
| A | Saplings, less than 10 feet |

**Stand Density (applied separately to overstory and** subordinate **young growth in two-storied stands, the** first **density value referring to the overstory,** the second **to the** understory).

| | |
|---|---|
| 1 | 75 **to 100%** crown **coverage** |
| 2 | 50 **to** 75% crown coverage |
| 3 | 25 to 50% Crown coverage |
| 4 | 5 **to 25%** crown **coverage** |

### Species Composition

| | |
|---|---|
| R | Redwood |
| RD | Redwood - Douglas-fir with O-508 proportion of Douglas-fir |
| DR | **Redwood** - Douglas-fir with over 50% proportion of Douglas-fir |
| D | Douglas-fir |
| S | **Spruce** |
| W | White fir or grand fir |
| C | Western red cedar |
| N | **denotes** scrub form or cliff **areas within** a species class |

### Non-timber Classes

| | |
|---|---|
| G | **Grass** |
| H | Hardwoods |
| Br | Brush |
| K | Cliffs, Rocks, Slides |
| X | Clear-cut |
| I | Industrial |

Unstacked timber sites occupied by hardwoods, grass, or brush are denoted with conifer symbols as a denominator, i.e., H/RD.

The timber classes are designated by fractional symbols, with stand structure and stand density above the line, and species composition below the line. For example, RB34/R Indicates a redwood timber stand with a residual overstory of density 3 and a small pole understory of density 4.

## FORESTRY MAPS

Forest maps provide a visual display of the resource as well as a management planning base. The maps provided are designed to be used as an integral part of the inventory. They have been prepared in digital format by layering each level of information. The four basic layers are land net, roads, water courses, and stand types. The digital data is designed for reformatting into a Geographic Information System. Computer tapes of each mapping layer are available upon request.

### Base Maps

To provide base maps on which to delineate the timber stand classification and from which to digitize data, the United States Geological Survey (USGS) topographic quadrangles were used, each sheet covering an area of 7-l/2 minutes of latitude and longitude. The USGS quadrangles were photographically reproduced on mylar at a scale of 4" = 1 mile. The aerial photographs were then controlled to this base by means of Wernstedt-Mahan stereoscopic plotters which photogrammetrically correct for photo displacement.

## Land Net

The land net is composed of township and range, section and property lines, and the corners that define them. Corner information was obtained from the H.G. Chickering's Humboldt County Maps dated 1961, and from the updated copies of these maps supplied by the Pacific Lumber Company forestry staff. Additional corner information was obtained from the USGS quadrangles where corners were not identified by Chickering. Lines are defined by the resulting combination of Chickering and USGS corner points, and by cut lines that were identified on the 1:12000 photographs. Property lines were obtained from 1" = 1 mile Humboldt county maps and from 4" = 1 mile HJW township maps da ted January 1, 1957. These maps were supplied by the Pacific Lumber Company forestry staff who had updated them for any boundary changes that had occurred between 1957 and 1986. The Pacific Lumber Company forestry staff assisted by editing and verifying these lines on advance prints of the maps. No new field editing of boundary information was undertaken as part of this project.

## Timber Stand Maps

The timber stand classes, as delineated on the aerial photographs, were superimposed onto the 4" = 1 mile scale base maps. The transfer from photos to base map was done by means of the Wernstedt-Mahan stereoscopic plotters. These maps directly served the inventory in providing a basis for measurement of acreages occupied by the various classes of timber stands.

A Talos digitizing board was used for area measurement. Because acreage measured on a paper copy of the timber stand maps is not exact, a correction factor for "stretch" in the paper was applied. The acreage measurements were controlled on a section

basis. If the difference between the total area of the section and the sum of the polygon areas was less than one percent of the total, the operator force-balanced the polygons to the section total. The computer adjusted polygon areas by adding or subtracting the difference between the totals to the most likely polygons. If other measurement systems are used, minor differences may result.

## TIMBER VOLUME ESTIMATES

### Sample Design

The timber volume estimate presented in this report is based on a line-plot cruise related to the timber stand classification. Stratified sampling was employed to provide an extremely precise estimate of the total forest volume while providing the forest manager with useful information by stand type. Allocation of plots by stand type and total number of plots were determined to ensure that: (1) the estimate of total forest volume would vary no more than plus or minus 5 percent at the 95 percent confidence level, (2) estimates of per acre volume by stand type would, for most significant stand types, vary no more than plus or minus 20 percent at 1 standard deviation, and (3) the distribution of plots would adequately represent the entire property.

Preliminary estimates of acreage and coefficients of variation from previous inventories were used to allocate sample plots. As the inventory progressed, the early estimates were revised using information from sample plots. The confidence interval on the total volume estimate, based on the stratified sample of plots, is 2.4% at the 95% confidence level. This precision level is well within the desired level of 5%.

| Major Stand Type | Number of Plots |
|---|---|
| RC3R_S | 29 |
| RC4R_N | 101 |
| RC4R_S | 118 |
| RY2R | 17 |
| RY2RD | 13 |
| RY3R | 9 |
| RY3RD | 20 |
| S4R | 42 |
| XD | 4 |
| XR | 6 |
| Y1DR | 38 |
| Y1R_N | 24 |
| Y1R_S | 100 |
| Y1RD | 221 |
| Y2R | 236 |
| Y2RD | 92 |
| Y3DR | 30 |
| Y3R | 165 |
| Y3RD | 38 |
| Y4D | 21 |
| Y4RD | 18 |
| YC1DR | 20 |
| YC1R | 18 |
| YC1RD | 130 |
| YC1RDW | 21 |
| YC2R | 30 |
| YC2RD | 78 |
| YC3R | 57 |
| YC3RD | 48 |
| YC3RDW | 29 |
| YC4R | 52 |
| YR1R | 43 |
| YR2R | 195 |
| YR2RDW | 21 |
| YR3R | 76 |
| YR3RDW | 44 |
| YY1D_R | 54 |
| YY1ND_R | 35 |
| YY1R | 18 |
| YY2D_R | 58 |
| YY2RD | 11 |
| YY3D_R | 22 |
| YY4D_R | 23 |
| YY4ND_R | 22 |
| YYR1RDW | 14 |
| YYR2R | 188 |
| YYR3R | 90 |
| YYR4R | 16 |
| BRUSH | |
| GRASS | |
| INDUSTRIAL | |
| WATER | |
| ROCK | |

| Major Stand Type | Number of Plots |
|---|---|
| AD | 3 |
| AR | 5 |
| B1D_R | 16 |
| B1R | 16 |
| B1RD | 40 |
| BRD | 2 |
| BRR | 5 |
| C1D_R | 27 |
| C1DR | 51 |
| C2R | 20 |
| C3D_R | 19 |
| C3RD | 47 |
| C4R | 22 |
| H | A |
| HD | A |
| HR | 4 |
| O1DR | 24 |
| O1R | 21 |
| O1R E | 29 |
| O1RD | 133 |
| O1RD E | 28 |
| 02R | 30 |
| OZRD | 31 |
| OO1R | 28 |
| 002R | 19 |
| OYY1D N | 19 |
| OYY1D S | 43 |
| OYY1DR | 29 |
| OYY1R | 20 |
| OYY1RD | 78 |
| OYY1RD E | 24 |
| OYY2D | 27 |
| OYY2D R | 55 |
| OYY2DR | 17 |
| OYY2RD | 61 |
| OYY3D | 31 |
| OYY3D R | 74 |
| OYY3RD | 45 |
| OYY4D | 38 |
| OYY4D R | 129 |
| [illegible] | 15 |
| R2RD | 55 |
| R3D | 19 |
| R3DR | 19 |
| R3R N | 315 |
| R3R S | 88 |
| R3RD | 102 |
| R4D | 30 |
| R4D R | 126 |
| R4DR | 32 |
| R4DWC | 7 |
| R4R N | 312 |
| R4R S | 142 |
| R4RD N | 47 |
| R4RD S | 41 |
| R4RSW | 16 |
| RB3R | 35 |
| RB4R N | 77 |
| RB4R S | 53 |
| RC3R N | 18 |

## FORMULA FOR SAMPLE PLOT ALLOCATION

$$n_T = \frac{\left[\sum_{i=1}^{K} \left(\frac{N_i}{N}\right)^2 \frac{CV_i^2 \bar{X}_i^2}{W_i}\right] t^2}{CI^2 \bar{X}_T^2} \quad ; \quad W_i = \frac{N_i S_i}{\sum_{i=1}^{K} N_i S_i} \quad ; \quad n_1 = n_T W_i$$

$n_T$ = total sample size

$n_i$ = sample size in stand type i

N = total number of acres in property

$N_i$ = total number of acres in stand type i

$\bar{X}_T$ = estimated average volume of the property

$\bar{X}_i$ = estimated average volume in stand type i

CI = desired percentage confidence interval around the estimate

$CV_i$ = coefficient of variation in stand type i

t = t statistic at specified level of confidence

## Sample Plot Procedures

One-fifth acre circular plots were used for conifers 24 inches diameter and larger, with concentric l/50 acre sub-plots for trees between 8 inches and 22 inches in diameter. On the plots, coniferous trees were measured with a diameter tape at 4-l/2 feet (breast height) above the ground on the up-hill side of the tree. All diameters were recorded by 2-inch class. The heights of all sawlog-sized trees were recorded by numbers of 16 foot logs to the following top diameters inside bark (d.i.b.):

| Diameter Class | Top d.i.b. |
|---|---|
| 8 to 22" | 6" |
| 24 to 38" | 8" |
| 40" & larger | 12" |

The stand class of the plot was recorded, and each tree on the plot was tallied separately, allowing the following data to be obtained: species and age classes diameter, log height, live crown ratio (young growth trees in Residual and Young Growth Stands only), merchantability, and-log-grades. Old growth redwood was graded into four classes, all other species into six. A description of these data elements follows:

STAND CLASS. -- The timber classification for the area in which the plot was located (see heading Timber Classification for a complete description of the classification system).

TREE SPECIES AND AGE CLASS -- Since tree growth represents a continuum between young and old age, the terms old growth and young growth applied to standing trees are somewhat subjective in the absence of a known age for every tree. Characteristics indicative of age, such as bark color, shape and crown form were

used by the cruisers. The old growth designation is generally applied to the type of tree in the virgin stands or first growth trees, and the young growth designation is applied to second growth trees.

All trees in uncut stands were cruised and reported as old growth. In large young growth stands (YY) in the pure Douglas-fir types, all Douglas-fir was combined and included in old growth total volumes. In young growth stands small old growth Douglas-fir was combined with young growth Douglas-fir in those instances where the total gross volume of the old growth was minor (i.e., 1,500 board feet per acre or less).

| Species | Code | Species | Code |
|---|---|---|---|
| Old growth redwood | 11 | Young growth redwood | 12 |
| Old growth Douglas-fir | 31 | Young growth Douglas-fir | 32 |
| Old growth white fir | 41 | Young growth white fir | 42 |
| Old growth hemlock | 51 | Young growth hemlock | 52 |
| Old growth cedar | 71 | Young growth cedar | 72 |
| Old growth Sitka spruce | 81 | Young growth Sitka spruce | 82 |

DIAMETER -- Each tree 7.0 inches DBH and larger was measured- -with a diameter tape at breast height. Diameters were recorded to the nearest two-inch class. Trees which were impossible. to measure were compared to neigboring trees and estimated.

HEIGHT -- Log heights (16-foot logs) were estimated for all trees to the following d.i.b.'s: Trees of DBH 40" and larger were measured to a 12" top, trees with DBH between 24 and 38 inches were measured to an 8" top, and trees with DBH smaller than 24" were measured to a 6" top d.i.b. A Topcon rangefinder was used to measure tree height, in combination with a Clinometer.

TREE CLASS -- Tree class is a numerical indication of the type of dead and down timber. Tree class 1 indicates that the measured tree is a snag, tree class 3 that it ia a down log with merchantable material, and tree class 6 that it is a down chunk with merchantable material.

CROWN CLASS -- Represents the live crown ratio (to the nearest ten percent) and was measured on young growth trees found in residual or young growth stands.

MERCHANTABILITY CLASSES --

Merchantable logs are those that can be classified into one of the log grades used in this inventory. The log-grade subdivisions of this class are defined in the following section;

**Unmerchantable** volume consists of sound wood that is not suitable for manufacture of **lumber. It** includes very rough logs and volume **that would be lost through** breakage, the latter **determined during the computer** processing phase of **this project**

**Cull volume includes the defective portions of logs containing indications** of **extensive internal** decay and those very badly fire scarred logs. **Any log that** is more than **three fourths** defective is considered to **be** cull.

LOG GRADES --

**The** following log grade specifications were used in this inventory:

-- OLD GROWTH REDWOOD --

No. 1 Redwood Sawlog

**Logs 30 inch**es or larger **in** diameter inside bark at the small end: 90%' surface clear. Two scattered knots permitted. Additional knots permitted **only** if they are within 1 foot of either **or** both ends.

Slabs 12 inches by 18 inches by 8 feet or equivalent, so long as minimum dimension exceeds 8 inches and piece is 90% surface clear.

No. 2 Redwood Sawlog

Logs 24" or larger in diameter inside bark at the small end containing at least 75 percent or more continuous clear length on all faces: or 3 faces clear for entire log length: or scattered knots not exceeding 1 knot for each 10 inches of log diameter.

Slabs 12 inches by 18 inches by 8 feet, so long as minimum dimension exceeds 8 inches and piece is 75% surface clear.

No. 3 Redwood Sawlog

Logs 16 inches in diameter inside bark at the small end not meeting the requirements for No. 1 or No. 2.

No. 4 Redwood Sawlog

Merchantable logs lens than 16 inches diameter inside bark at the small end.

Logs in grades 1 or 2 having the maximum knot allowance must be otherwise of good appearance or dropped to the next lower grade. Logs with twist, sweep, excessive cross grain, etc., should be dropped 1 or 2 grades. Do not count as knots sap knots which will slab off. Apply these grades to down logs and chunks 8" and longer.

DOUGLAS FIR LOG GRADES --

(Northern California Log Scaling and Grading Bureau Log Grades)

No. 1 Douglas-fir Peeler

Logs small be old growth suitable for rotary cutting production of clear, uniform-colored veneer to an amount of not less than 50% of the net scaled content. Minimum d.i.b. 30 inches: 90% surface clear; knot indicators and burls permitted if within 3 feet of top or down one side and confined to l/10 of circumference. Burls, knots or knot clusters which would require a scaling deduction in any grade permissible if so located that a six foot or longer peeler block can be obtained on either side.

Note: For this cruise, to qualify as a No. 1 Peeler, the next log above in the tree must be at least a No. 2 Peeler.

No. 2 Douglas-fir Peeler

Logs shall be old growth suitable for rotary cutting production of clear, uniform-colored veneer to an amount of not less than 35% of the net scaled content. Minimum d.i.b. 30 inches: 75% surface clear; knot indicators and burls permitted if within 8 feet of top or down full length and confined to 1 quadrant. Burls, knots or knot clusters which would require a scaling deduction in any grade permissible if so located that a six foot or longer peeler block can be obtained on either side.

No. 3 Douglas-fir Peeler

Logs shall be old growth or young growth suitable for rotary cutting production of center core, cross core and backs or better to an amount equal to the net scaled content and must meet the following minimum requirements: minimum d.i.b. 24 inches: knots and knot indicators: shall be limited to indicators not to exceed l-1/2 inches in diameter. The maximum number of indicators should not exceed an average of one per foot

of log length (indicators l/2 inch and smaller in diameter shall not be considered); 2 knots permitted when recovery requirements can be met. Burls, knots, or knot clusters which would require a scaling deduction in any grade permissible if so located that a peeler block can be obtained on either side.

Special Mill

Logs for this grade must be suitable for the cutting of lumber in grades of Select merchantable or better in an amount equal to 65% of the net scaled content and be suitable for rotary cutting of veneer to an amount equivalent to the net scaled content in center core, cross-core and backs. Minimum d.i.b. 16 inches: knots and/or indicators: shall be limited to well scattered, sound, tight knots not to exceed l-1/2 inches diameter. The maximum number of knots and/or indicators should not exceed an average of one per foot of log length (indicators l/2 inch and smaller in diameter shall not be considered): this does not preclude the grading of a log with two larger knots when recovery requirements can be met. Burls and knot clusters of the type that would require a scaling deduction in any grade permitted if so located that peeler blocks can be obtained on either side of the defect.

No. 2 Douglas-fir Sawlog

Logs shall be suitable for the manufacture of lumber in grades: Construction or Better to an amount of not less than 65% of the net scaled content: or B and Better or equivalent grade to an amount of not less than 25% of the net scaled content. Minimum d.i.b. 12 inches; knots: sound, tight knots, 2-l/2 inches diameter and smaller as specified in the Standard Lumber Grading Rules for Construction Grade Boards. Larger knots, clusters, and burls must be so distributed as to permit the production of the required recovery.

No. 3 Douglas-fir Sawlog

Logs having defects which prevent their being graded No. 2, but which are suitable for the manufacture of not

less than 33-l/3% of the gross scaled content in Standard or Better grades of lumber and must meet the following requirements: minimum d.i.b. 6 inches: knots: sound, tight knots, 3 inches diameter and smaller as specified in the Standard Lumber Grading Rules for Standard Boards. Larger knots, knot clusters, and burls must be so distributed as to permit the production of the required amount of Standard or Better lumber.

No. 4 Douglas-fir Sawlog

Logs having less than the minimum diameter and/or **volume** which prevents their being graded No. 3, but which are suitable for **the** manufacture of not less than 33-l/3% of the gross volume in merchantable material.

In this cruise, No. 4 Sawlogs have been included with No. 3 sawlogs.

Cull Peeler

Peelable logs culled solely for conk rot which would otherwise meet the requirements for standard peeler grades.

Note: These grades were used for all whitewood species and the sawlog grades for for young growth redwood.

## Deductions for Breakage and Internal Defect

Average breakage was determined from recent utilization studies by HJW on industrial redwood forest lands. Top utilization and breakage were applied to each tree during the computer processing phase of the inventory.

Utilized top diameters determined for this cruise are as follows:

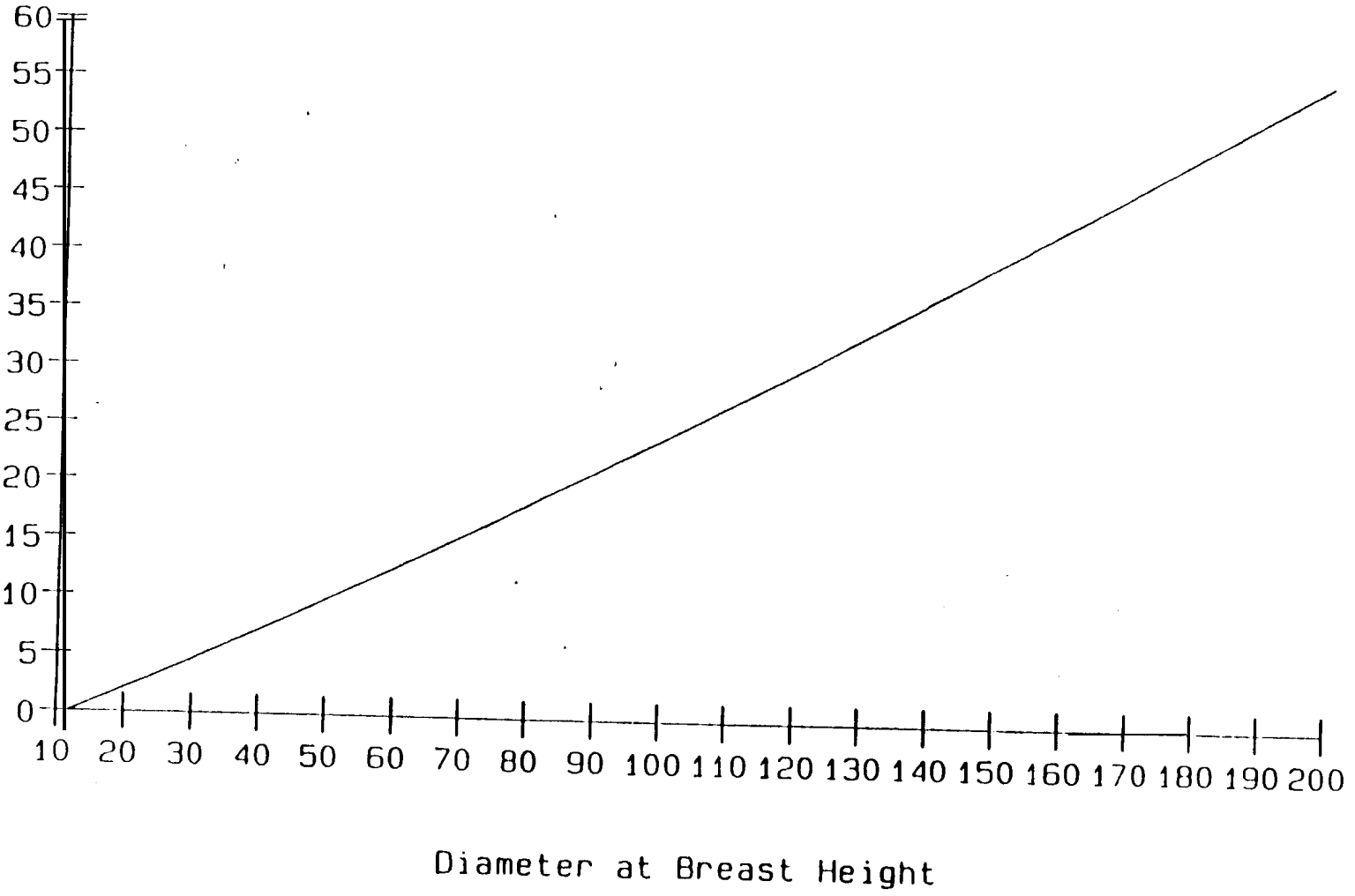
| Species | DBH Class | Utilized top d.i.b. |
|---|---|---|
| Redwood | 8-14" | 6 |
| | 16-22 | 7 |
| | 24" + | 0.663 + (0.306 X DBH) |
| Whitewoods | 8-14" | 6 |
| | 16-22 | 7 |
| | 24-38 | - 5.93 + ( 4.36 x (LN (DBH)) |
| | 40" + | -33.49 + (12.68 x (LN (DBH)) |

(LN denotes natural logarithm)

Breakage within the utilizable portion of the tree is related to the type of logging, i.e., tractor versus cable system. Separate breakage factors were developed for each method, then combined on a weighted average basis on the assumption that 67% of Pacific Lumber Company lands will be tractor logged and 33% cable logged. These breakage factors, applied as a percentage of gross utilizable volume as used in this cruise, are:

| Species | DBH Class | % of Utilizable Volume |
|---|---|---|
| Redwood | . 8-22" | 1% |
| | 24-38 | 3% |
| | 40" + | 5% |
| Whitewoods | < 40" | ( -0.07 + (0.0968 X DBH)) |
| " | > 40" | ( -3.604 + (0.132 X DBH)) |

# Solinsky Pratt Curve for Internal Defect of Redwood




Curve equation = $-2.79319 + (0.233234 \times DBH) + (4.24945^{10-4} \times DBH^{2}) - (6.26397^{10-7} \times DBH^{3})$

Figure 1.

In addition to the deduction from the gross volumes of redwood timber resulting from visible defects (fire scar/ etc.) and breakage in falling, experience has shown additional losses due to such internal defects at rot, rift cracks, shake, etc. are not visible in the standing tree. In this report, deduction percentages accounting for these hidden defects have been based on studies and on an analysis of industry cutting records. These studies show a definite correlation between the amount of defect and age, which is directly related to size.

The cruised not volumes of redwood have-keen reduced at the computer processing phase of the inventory by computing percentages according to the following equation to account for hidden defects not visible in the standing tree using the Pratt-Solinsky Curve (Figure 1):

$$-2.79319 + (0.233234 \times DBH) + (4.24945^{10-4} \times DBH^{2}) - (6.26397^{10-7} \times DBH^{3})$$

No additional allowance has been made for defect in the whitewood species as cruised defect is believed adequate. Since both the breakage and hidden defect factors were applied internally during the data processing phase of the inventory, the cruise data may be adjusted easily using different factors if local experience so indicates.

## Volume Tables

For old growth redwood, measurements of down timber and the odolite measurements of standing trees were made on Pacific Lumber Company lands. From these measurements the scale volume

of each tree was calculated and then compared to five existing volume tables. The table that most closely compared with the Pacific Lumber tree measurements was the HJW/Solinsky table from Redwood National Park. Volumes for old growth trees 38" and below were computed from the Wensel-Bruce equations also developed for the Redwood Park.

Marshall Palley's young growth redwood volume table was used for young growth trees 24-38" D.B.H. This table was adjusted to a 6" top for trees 22" and less. Volumes for young growth trees 40" and larger were from the HJW/Solinsky table for old growth.

Measurements of down timber, and relaskop measurements were made on standing trees to develop average form classes for Douglas-fir and other whitewood species on the Pacific Lumber Company lands. Average form classes were determined as follows:

| Species | Area | DBH Class | Form Class |
|---|---|---|---|
| Douglas-fir | Rainbow/Monument | 8 to 22" | 75 |
| Douglas-fir | Rainbow/Monument | 24" and larger | 70 |
| Douglas-fir | all other areas | 8 to 22" | 75 |
| Douglas-fir | all other areas | 24" and larger | 74 |
| Other whitewoods, | all areas | | 81 |

Final volume tables for whitewoods were developed using the average form classes and expanding the Behre hyperbola formula, which defines taper above the first log. Coefficients in the formula were adjusted so that predicted diameters at points chosen on the bole gave volumes which most closely matched the actual scaled volumes. The coefficients thus developed are:

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1/ Marshall Palley, University of California, Volume Table for Young Growth Redwood, 1958.

DOUGLAS-FIR

| DBH Class | Coefficients Alpha | Beta |
|---|---|---|
| 8 to 38" | .462 | .538 |
| 40" 6 larger | .381 | ,619 |

WHITEWOODS

| | | |
|---|---|---|
| 8″ + | .462 | .538 |

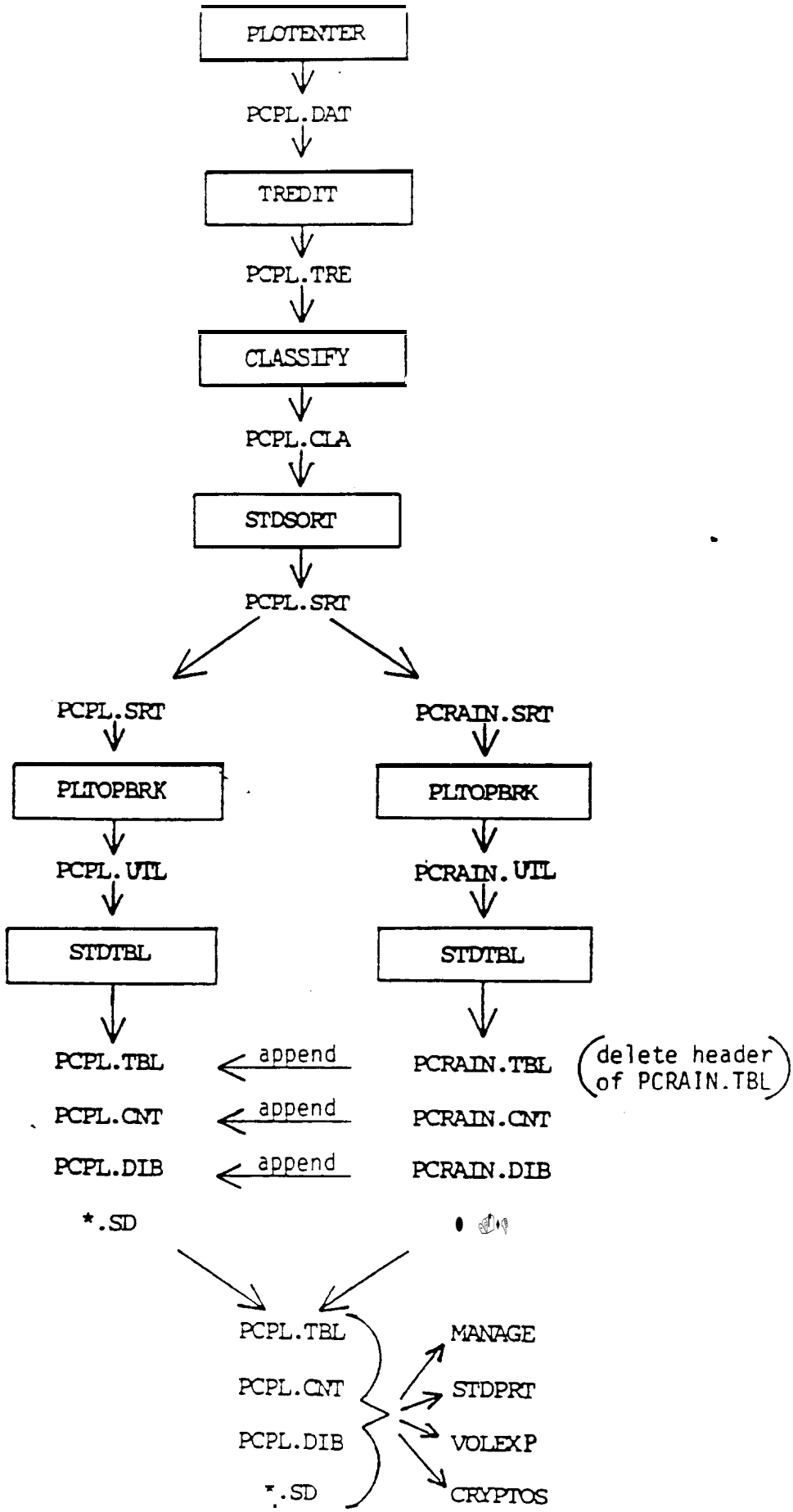
## Volume Computation

The following steps were used in converting the field measurement data into usable volume information, using the HJW software system (see operators manual):

1. Enter data through the PLOTENTER program and edit the resulting data file.
2. Group plots from minor stands with most applicable major stand class with the CLASSIFY program.
3. Sort plots by stand classes with the STDSORT program.
4. Use the utilization program PLTOPBRK to'apply the appropriate utilization standards to the tree data, and to verify grades of individual logs having diameter limits.
5. Use the STDTBL program to create tables by species and stand class. These stand tables list the number of trees-and volumes per acre. Net, gross and total volumes are-summed, not calculated.
6. Print the stand tables by running the STDPRT program.
7. Calculate the total volume for the property and for the north and south units by multiplying the acreage of each stand class by the stand table volumes per acre using the VOLEXP program.

## Minor Stand Groupings

The basic stratification and subsequent field sample developed 99 discrete strata which are useful for management and were sampled in sufficient detail to be meaningful. A number of other types which are recognizable on the aerial photography were shown to have insignificant acreages, or insufficient differences from closely related stands, and did not warrant a separate stand class. These minor stands were, therefore, grouped with the most representative major type. The following list shows the minor stands as they were grouped


PLOTENTER
PCPL.DAT
TREDIT
PCPL.TRE
CLASSIFY
PCPL.CLA
STDSORT
PCPL.SRT
PCPL.SRT
PCRAIN.SRT
PLTOPBRK
PLTOPBRK
PCPL.UTL
PCRAIN.UTL
STDTBL
STDTBL
PCPL.TBL
append
PCRAIN.TBL
delete header of PCRAIN.TBL
PCPL.CNT
append
PCRAIN.CNT
PCPL.DIB
append
PCRAIN.DIB
*.SD
PCPL.TBL
PCPL.CNT
PCPL.DIB
*.SD
MANAGE
STDPRT
VOLEXP
CRYPTOS

-- OLD GROWTH STANDS --

| Table No. | Major Stand Type | Minor Grouping |
|---|---|---|
| 1 | 001/R | |
| 2 | 002/R | |
| 3 | 01/R Elk/Salmon | |
| 4 | 01/R | |
| 5 | 02/R | |
| 6 | Ø1/RD Elk/Salmon | |
| 7 | Ø1/RD | |
| 8 | Ø2/RD | |
| 9 | Ø1/DR | |
| 10 | ØYY1/R | ØY1/R |
| 11 | ØYY1/RD Elk/Salmon | |
| 12 | ØYY1/RD | ØYY1/RDW, ØY1/RD |
| 13 | ØYY2/RD | ØYY2/R, ØYY2/RDW, ØYY2/RDS, ØY2/R, ØY2/RD, |
| 14 | ØYY3/RD | ØYY3/R, ØYY3/RDS, ØYY3/RDW, ØYY4/DR, ØYY4/R, ØYY4/RD, 003/R, 03/R, Ø3/RD, 04/R, Ø4/DR, ØY3/R, ØY3/RD, ØY4/R, ØY4/RD |
| 15 | ØYY1/DR | ØY1/DR |
| 16 | ØYY2/DR | Ø2/DR, ØY2/DR |
| 17 | ØYY1/D North | |
| 18 | ØYY1/D South | ØYY1/DW |
| 19 | ØYY2/D Rainbow/Monument | ØYY2/DW |
| 20 | ØYY2/D | |
| 21 | ØYY3/D Rainbow Monument | |
| 22 | ØYY3/D | |
| 23 | ØYY4/D Rainbow/Monument | ØYY4/DW |
| 24 | ØYY4/D | |

-- RESIDUAL STANDS --

| | | |
|---|---|---|
| 25 | R2/R | |
| 26 | R3/R North | |
| 27 | R3/R South | |
| 28 | R4/R North | |
| 29 | R4/R South | |
| 30 | R2/RD | R2/RDW, R1/DR |
| 31 | R3/RD | R3/RDW, R3/RSW, RB32/RD, RB33/RD, RC31/RD, RC33/RD, RC34/RD, RC31/RDW |

| Table No. | Major Stand Type | Minor Grouping |
|---|---|---|
| 32 | R4/RD North | RB41/RD, RB42/RD, RB43/RD, RB44/RD, RC41/RD, RC42/RD, |
| 33 | R4/RD South | R4/RDW, RB42/RD, RB43/RD, RC44/RDW |
| 34 | R4/RSW | |
| 35 | R3/DR | |
| 36 | R4/DR | RB44/DR |
| 37 | R4/DWC | R3/DWC |
| 38 | R3/D | |
| 39 | R4/D Rainbow/Monument | R2/D, R3/D, R3/DW, R4/DW, RY3/D, RY4/D, RB41/D, RB43/D, RB44/D |
| 40 | R4/D | RA43/D, RA44/D, RB44/D |
| 41 | RY2/R | RY1/R |
| 42 | RY3/R | S3/R |
| 43 | RY2/RD | SY2/RD |
| 44 | RY3/RD | RY4/RD, SY3/RD, SY3/RDW |
| 45 | RC3/R North | RC31/R, RC32/R, RC33/R |
| 46 | RC3/R South | RC31/R, RC32/R, RC33/R |
| 47 | RC4/R North | RC41/R, RC42/R, RC43/R, RY41/R, RY43/R |
| 48 | RC4/R South | RC41/R, RC42/R, RC43/R, RC44/R, RY41/R |
| 49 | RB3/R | RB31/R, RB32/R, RB33/R, RB34/R |
| 50 | RB4/R North | RB41/R, RB42/R, RB43/R, RB44/R |
| 51 | RB4/R South | RB41/R, RB42/R, RB43/R, RB44/R |
| 52 | S4/R | S4/RD, SY4/R, SY4/RDW, SC41/R, SC42/R, SB43/R, SB44/R, SA41/R, SB42/R |
| | -- RESIDUAL YOUNG GROWTH STANDS -- | |
| 53 | YYR1/RDW | YYR1/RD, YR1/RDW, YY1/RD, YY1/RDW |
| 54 | YYR2/R | YY2/R |
| 55 | YYR3/R | YYR3/RDS, YYR3/RSW, YY3/R |
| 56 | YYR4/R | YR4/R, YY4/R |
| 57 | YR1/R | |
| 58 | YR2/R | |
| 59 | YR3/R | |
| 60 | YR2/RDW | YR2/DR, YR2/RD, YR2/RDS, YR2/RS |
| 61 | YR3/RDW | YR3/RD, YR3/RDS, YR4/RD, YR4/RDW, YR4/RDS |

-- LARGE SIZE YOUNG GROWTH --

| Table No. | Major Stand Type | Minor Grouping |
|---|---|---|
| 62 | YY1/R | |
| 63 | YY2/RD | YY2/DR, YY2/RDS |
| 64 | YY1/D Rainbow/Monument | YY1/DW, Y1/D |
| 65 | YY2/D Rainbow/Monument | YY2/DW, Y2/D |
| 66 | YY3/D Rainbow/Monument | YYC32/D, YYR3/D, Y3/D, Y3/DW |
| 67 | YY4/D Rainbow/Monument | YYC42/D, YYC43/D, YYC44/D, Y4/D |
| 68 | YY1/ND Rainbow/Monument | YY2/ND, YYC24/ND |
| 69 | YY4/ND Rainbow/Monument | YY3/ND, YYC33/ND, YYC42/ND, YC4/ND |

-- MEDIUM SIZE YOUNG GROWTH --

| | | |
|---|---|---|
| 70 | Y1/R North | |
| 71 | Y1/R South | |
| 72 | Y2/R | |
| 73 | Y3/R | Y4/R, Y4/NR |
| 74 | Y1/RD | Y1/RDW, Y1/RSW |
| 75 | Y2/RD | Y2/RDW, Y2/RSW |
| 76 | Y3/RD | Y3/RDW, YY3/RDW |
| 77 | Y4/RD | Y4/RDW, Y4/RSW, YY4/RD, YY4/RS |
| 78 | Y1/DR | Y2/DR, YY1/DR |
| 79 | Y3/DR | Y4/DR |
| 80 | Y4/D | YR3/D, YR4/D |
| 81 | YC1/R | |
| 82 | YC2/R | |
| 83 | YC3/R | |
| 84 | YC4/R | YC4/DR, YC4/RD |
| 85 | YC1/RD | |
| 86 | YC2/RD | YC2/RDW |
| 87 | YC3/RD | YC3/DR |
| 88 | YC1/RDW | |
| 89 | YC3/RDW | YC4/RDW |
| 90 | YC1/DR | YC2/DR |

-- SMALL SIZE YOUNG GROWTH --

| Table No. | Major Stand Type | Minor Grouping |
|---|---|---|
| 91 | C2/R | Cl/R, Cl/RD, Cl/RDW, C2/RD, C2/RDW |
| 92 | C4/R | C3/R |
| 93 | C3/RD | C3/DR, C4/RD, C4/RDW |
| 94 | Cl/DR | Cl/DWR, C2/DR |
| 95 | Cl/D Rainbow Monument | Cl/DW, C2/D, YCl/D, YC2/D, YC2/DW |
| 96 | C3/D Rainbow Monument | C4/D, YC3/D, YC3/DW |
| 97 | Bl/R | B2/R, B3/R, B3/R, B4/NR |
| 98 | Bl/RD | Bl/RDW, Bl/DR, B2/RD, B2/DR, B3/RD, B3/RDW, B3/DR, B4/RD, B4/DR |
| 99 | Bl/D Rainbow Monument | Bl/DW, B2/D, B3/D, B4/D |